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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/628,181	07/25/2003	Min-Yi Shih	134404	5586

6147 7590 06/22/2009
GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
PATENT DOCKET RM. BLDG. K1-4A59
NISKAYUNA, NY 12309

EXAMINER	
VARGOT, MATHIEU D	

ART UNIT	PAPER NUMBER
1791	

NOTIFICATION DATE	DELIVERY MODE
06/22/2009	ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MIN-YI SHIH
and THOMAS BERT GORCZYCA

Appeal 2008-005870
Application 10/628,181
Technology Center 1700

Decided:[1] June 18, 2009

Before CHARLES F. WARREN, PETER F. KRATZ, and
CATHERINE Q. TIMM, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1 through 8, 10, 11, and 13 through 32 in

[1] The two month time period for filing an appeal or commencing a civil action specified in 37 C.F.R. § 1.304, begins to run from the Decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

the Office Action mailed August 22, 2007. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2007).

We reverse the decision of the Primary Examiner.

Claim 1 illustrates Appellants' invention of a method of forming a wave guide, and is representative of the claims on appeal:

1. A method of forming a waveguide comprising a core region, a cladding region, and an index contrast region situated therebetween, the method comprising:

depositing a polymerizable composite on a substrate to form a layer, wherein the polymerizable composite comprises a polymer binder and an uncured monomer,

patterning the layer to define an exposed area and an unexposed area of the layer in a manner such that the unexposed area includes the core region,

irradiating the exposed area of the layer to polymerize the polymerizable composite in the exposed area, and

volatilizing the uncured monomer in the unexposed area by baking and by diffusing some uncured monomer from the unexposed area towards the exposed area to form the index contrast region of the waveguide.

The Examiner relies upon the evidence in these references (Ans. 3):

Chandross	US 3, 809,732	May 7, 1974
Suzuki	US 4,877,717	Oct. 31, 1989
Nishimura	US 6,828,078 B2	Dec. 7, 2004

Appellants request review of the ground of rejection under 35 U.S.C. § 103(a) advanced on appeal by the Examiner: appealed claims 1 through 8, 10, 11, and 13 through 32 over Suzuki or Chandross in view of Nishimura. Br. 3; Ans. 4.

Appellants' arguments are based on independent claims 1 and 16. Br. 4 and 6. Thus, we decide this appeal based on these claims. 37 C.F.R.

§ 41.37(c)(1)(vii) (2007).

Issue

The issue in this appeal is whether Appellants have shown that that the evidence in the combined teachings of Chandross, Suzuki, and Nishimura does not support the Examiner's conclusion of prima facie obviousness with respect to the claimed methods encompassed by claims 1 and 16.

Claim Interpretation

In order to consider the issues raised in this appeal, we first interpret independent claims 1 and 16 by giving the terms thereof the broadest reasonable interpretation in their ordinary usage in context as they would be understood by one of ordinary skill in the art in light of the written description in the Specification unless another meaning is intended by Appellants as established therein, and without reading into the claim any disclosed limitation or particular embodiment. *See*, *e.g.*, *In re ICON Health and Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007); *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004), and cases cited therein; *In re Morris*, 127 F.3d 1048, 1054-55 (Fed. Cir. 1997).

We determine that claims 1 and 16 specify, in pertinent part, a method comprising at least the steps of, among other things, patterning a layer of polymerizable composite comprising a polymer binder and an uncured monomer on a substrate such that the unexposed area includes the core region of the wave guide, and after irradiating the exposed area of the layer, volatilizing the uncured monomer in the unexposed area by baking to diffuse some uncured monomer from the unexposed area towards the exposed area

to form the index contrast region between the core region and the cladding region of the waveguide.

Findings of Fact

We find Chandross would have disclosed to one of ordinary skill in this art, as illustrated by embodiments depicted in Figures 2C-D, a method of forming, among other things, a waveguide including the steps of depositing a polymer film with a higher index photosensitive monomer on a substrate, irradiating an area of the layer to form the core region, and heating the construct to evaporate the remaining unexposed dopant. Chandross, e.g., abstract, col. 2, ll. 35-62; col. 3, l. 39 to col. 6, l. 7, and col. 8, l. 72 to col. 9, l. 17. Chandross characterizes the method as "'photo-locking'" wherein

> [t]he dopant monomer is selected so that it is moderately volatile and undergoes molecular structural change upon exposure to radiation . . . [and] attaches to the polymer of the film, dimerizes or polymerizes upon selective irradiation . . . resulting in substantial reductions or even complete elimination of the mobility and volatility of the dopant in the polymer matrix. Selected portions of the higher index dopant are thus photochemically locked in the polymer film. Simple heating is then employed to evaporate the remaining unexposed dopant. The heating step leaves the exposed dopant material in position in the film and has two consequences: first, the refractive index of the exposed area of the sample is intermediate between that of the starting polymer sample and that of the dopant monomer itself; and, secondly, the thickness of the polymer film in the unexposed areas of the sample is reduced due to the removal of the unexposed dopant.

Chandross col. 2, ll. 35-39 and 44-62; *see also* col. 3, ll. 39-55, col. 4, ll. 27-32, col. 5, ll. 41-52, col. 5, l. 66 to col. 6, l. 7, col. 8, l. 74 to col. 9,

l. 17, and Figs. 2C-D. Chandross discloses particular dopants and polymers which provide the "photo-locking." Chandross col. 6, l. 32 to col. 8, l. 71, and col. 9, ll. 1-11.

We find Suzuki would have disclosed to one of ordinary skill in this art a method of forming an optical element, such as a waveguide, including the steps of

> forming on a substrate a light-sensitive film containing at least a photoreactive compound capable of causing a migration of unreacted compound from an unexposed area to an exposed area as an exposure function, thereby changing a configuration of exposed light-sensitive film, and
>
> selectively exposing the light-sensitive film to obtain an optical element having a desired configuration.

Suzuki col. 2, ll. 59-68; *see also*, e.g., col. 4, ll. 21-34. Suzuki discloses particular "photoreactive compounds are those which are capable of inducing polymerization, cross-linking, isomerization or other photoreactions" and provide "migration." Suzuki, e.g., col. 4, l. 35 to col. 8, l. 55. The exposed film can be stabilized by "treatment of the film with heat . . . to remove the unreacted photoreactive compounds from the film by evaporation." Suzuki col. 8, ll. 56-66. Suzuki illustrates the method with a mechanism for formation of lens, illustrated in Figures 7 and 8, wherein

> [d]uring exposure, the monomers M in the unexposed area permeate or migrate into the exposed area, and in the exposed area, as a result of photopolymerization caused by the exposure, polymers with a low polymerization degree (LPD-P) and polymers with a high polymerization degree (HPD-P) are concurrently produced. This stage . . . described . . . [in] FIG. 8, showing an interfacial area 5 between the exposed and unexposed areas of the light-sensitive film 2. In the interfacial area 5, the binding polymers BP are rich and the monomers M

> are poor. Accordingly, and since the area 5 is harder than other portions of the film 2, the area 5 acts as a "semipermeable membrane." The monomers M diffuse in each of the exposed and unexposed areas, and, as shown by the arrows M, permeate from the unexposed area through the interfacial area or semipermeable membrane to the exposed area due to an osmotic pressure created between the two areas. . . . In the exposed area, polymerization of the monomers M occurs, and thus the amount of the polymers HPD-P, LPD-P, and B is gradually increased. . . .
>
> After exposure, the binding polymers BP and a small amount of the monomers M remain in the unexposed area. On the other hand, polymers HPD-P, the monomers M, and the binding polymers BP remain in the exposed area. The monomers M, i.e., unreacted compounds in this area can be removed from the film by heat treatment. . . .

Suzuki col. 10, l. 23 to col. 11, l. 32. We find one of ordinary skill in this art would observe in Figure 8 a significant increase in the amount of material in the exposed area, swelling that area.

Suzuki further discloses an optical waveguide embodiment, illustrated in Figure 24, which is formed by exposing an area causing it to swell, thus forming the core region. Suzuki, col. 18, ll. 2-49, and Figs. 20A-B.

We find Nishimura would have disclosed to one of ordinary skill in this art a method of forming an optical element, such as a waveguide, including the steps of, among other things, applying a refractive index changing composition to a substrate, exposing patterned areas of the substrate to irradiation and heating "to make a refractive index difference between exposed and unexposed portions of the refractive index changing composition" layer. Nishimura, e.g., col. 34, ll. 16-31. Nishimura illustrates the method with respect to waveguides in an embodiment wherein a

refractive index changing composition is applied to a lower clad film layer on a substrate, shielding the core region with a photomask which exposes the side clad region of the layer, irradiating the exposed side clad region, and baking the construct. Nishimura col. 40, l. 49 to col. 41, l. 26.

Nishimura discloses particular compounds which are used to form the refractive index changing compositions. Nishimura, e.g., col. 3, l. 64 to col. 37, l. 54.

The Examiner does not dispute Appellants' findings that the chemistries of the compositions employed by Chandross and by Suzuki are different than the compositions of Nishimura. Br. 5-6 and 8; Ans. 7:4-9.

Discussion

We considered the totality of the record in light of Appellants' arguments with respect to claims 1, 2, 7, 12, and 26, and the ground of rejection advanced on Appeal. *See, e.g., In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("'On appeal to the Board, an applicant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness.") (quoting *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998); *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992) ("After evidence or argument is submitted by the applicant in response, patentability is determined on the totality of the record, by a preponderance of evidence with due consideration to persuasiveness of argument.") (citing, inter alia, *In re Spada*, 911 F.2d 705, 707 n.3 (Fed. Cir. 1990)).

We are of the opinion Appellants have shown that that the evidence in the combined teachings of Chandross, Suzuki, and Nishimura does not

support the Examiner's conclusions of prima facie obviousness with respect to claims 1 and 16.

We agree with Appellants that, on this record, one of ordinary skill in this art would not have combined Chandross, Suzuki and Nishimura leading to the modification of the methods of Chandross and of Suzuki by masking the core region and exposing the cladding region of the layer merely on Nishimura's disclosure that a waveguide can be prepared when the core region is unexposed. Br. 5-6 and 8. As Appellants point out, Nishimura's method is not that of Chandross or of Suzuki, and the Examiner does not explain why this person would have masked the core region in these methods, particularly in view of the differences in chemistries as argued by Appellants. Ans. 7; Br. 5-6 and 8. Thus, the step of patterning the layer such that the core region is unexposed as required by claims 1 and 16 is not taught by the combination of references. *See above* pp. 3-4.

Furthermore, on this record, we agree with Appellants that the methods of Chandross and of Suzuki do not result in the formation of an index contrast region by diffusion of uncured monomer from the unexposed region toward the exposed region during volatilization as required by claims 1 and 16. Br. 4-5 and 7-8. Indeed, in both references, the position of the uncured monomer in the film is a function of the irradiation step such that the uncured monomer is only evaporated from the film during the heating step. *See above* pp. 4-6. Thus, no reasonable basis appears in either reference supporting the Examiner's contention that the formation of an index contrast region is a "natural consequence" or "natural result" of the methods of the references. Ans., e.g., 5 and 6.

Accordingly, in the absence of a prima facie case of obviousness, we reverse the ground of rejection of appealed claims 1 through 8, 10, 11, and 13 through 32 under 35 U.S.C. § 103(a).

The Primary Examiner's decision is reversed.

REVERSED

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
PATENT DOCKET RM. BLDG, K1-4A59
NISKAYUNA, NY 12309